Projection reconstruction magnetic particle imaging.

Journal: IEEE Trans Med Imaging

Publication Year: 2013

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PubMed link: 23193308

Funding Grants: Magnetic Particle Imaging: A Novel Ultra-sensitive Imaging Scanner for Tracking Stem Cells In Vivo

Public Summary:
We acquire the first experimental 3-D tomographic images with magnetic particle imaging (MPI) using projection reconstruction methodology, which is similar to algorithms employed in X-ray computed tomography. The primary advantage of projection reconstruction methods is an order of magnitude increase in signal-to-noise ratio (SNR) due to averaging. We first derive the point spread function, resolution, number of projections required, and the SNR gain in projection reconstruction MPI. We then design and construct the first scanner capable of gathering the necessary data for nonaliased projection reconstruction and experimentally verify our mathematical predictions. We demonstrate that filtered backprojection in MPI is experimentally feasible and illustrate the SNR and resolution improvements with projection reconstruction. Finally, we show that MPI is capable of producing three dimensional imaging volumes in both phantoms and postmortem mice.

Scientific Abstract:
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